FOREST PRODUCTS
Project Fact Sheet

DEVELOPMENT OF FEEDSTOCK-TO-PRODUCT CHARACTERIZATION TOOLS FOR THE WOOD AND PULP INDUSTRY

BENEFITS

- Improves quality of wood products
- Provides greater energy efficiency
- Reduces processing waste
- Lowers production costs
- Enhances competitiveness of final products

APPLICATIONS

The specialized sensors will be adapted to identifying trees in the field with superior physical characteristics for wood products, to determining the chemical composition of the pulp, and to controlling the manufacture of the wood or paper product.

Thus, the technology could be applied by the forest products industry to the entire manufacturing process, from tree selection to finishing of the final product.

Control of the Entire Manufacturing Cycle Can Significantly Enhance the Quality of Wood Products

To optimize operations, better tools are needed to monitor and control the entire manufacturing process for wood and paper products. The National Renewable Energy Laboratory is adapting advanced infrared technology and chemometrics to on-line sensors that will oversee the complete manufacturing cycle, from tree selection to final finishing. Current methods for sampling, preparing, and analyzing wood to determine these properties are time-consuming and costly. Foresters, processors, and manufacturers will benefit from real-time techniques that provide information on feedstock properties quickly and inexpensively.

A field-mobile version of the technology will allow tree harvesters to measure the physical characteristics of their feedstock, such as density, shrinkage, and moisture content of standing or cut trees. Pulp processors can predict the quality of the final forestry product by measuring the chemical composition of their feedstock, chips, and pulp, including the lignin, cellulose, hemicellulose, and extractives. Wood and paper mill operators will be provided with a rugged form of the technology that will stand up in an industrial environment and provide feed-forward and feed-backward monitoring of the manufacturing processes. This integrated approach to process control would allow total quality control of paper manufacturing and help minimize the production of substandard or rejected products.

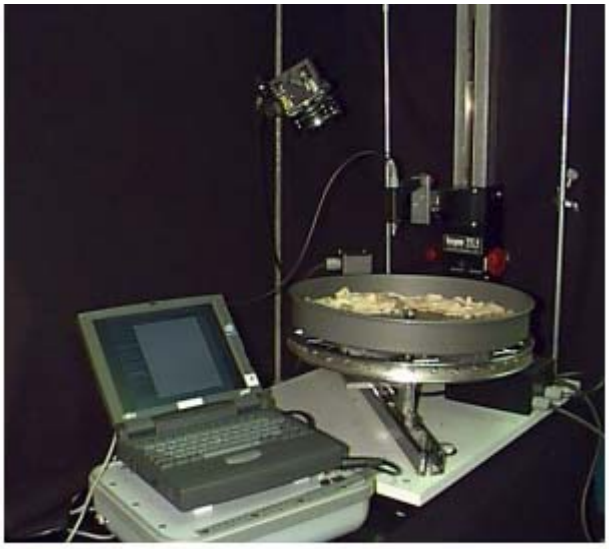


Figure 1. A field-mobile, Near InfraRed Spectrometer with a fiber optic probe determines the properties of wood chips in a rotating platen. The velocity of the platen simulates a feedstock stream moving at 400 ft/min.

PROJECT DESCRIPTION

Goal: To adapt advanced infrared technology to field-mobile and on-line sensors that monitor the manufacture of wood and paper products in real time.

This three-phase investigation will exploit Near Infrared Spectroscopy (NIRS) and multivariate statistical calibration techniques to develop real-time process control in a pulp and paper mill. Phases I and II will develop and test NIRS under simulated plant conditions as a reliable method for measuring the carbohydrates, lignin, and extractives of wood chips in a moving stream. Phase III will develop a hand-held, field-mobile, near-infrared device that can take measurements of density, lignin, and carbohydrates from standing or cut trees. The Weyerhaeuser Corporation will supply wood chips, authenticated chip samples, and chemical analyses of the chips during the study.

PROGRESS & MILESTONES

- The technology has been used for field analysis of trees and harvested timber.
- The techniques are being verified in off-line monitoring of a wood-chip stream designed to simulate an on-line feedstock stream moving at 400 ft/min.
- The moving feedstocks of 20 different hardwood and softwood species have been examined.
- Wet pulp and paper have been characterized chemically with the technology.
- The technology has been introduced into on-line process monitoring in a demonstration plant.
- It will be used to adjust operating conditions to achieve maximum productivity.

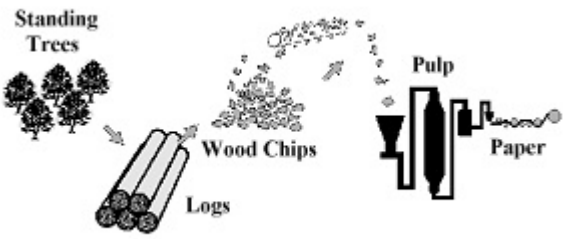
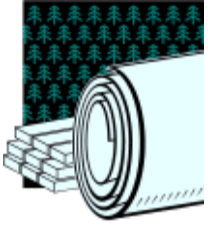


Figure 2. Diagram of the paper-making process.



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